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Hair-cell-specific Genes in the Embryonic Chicken Inner Ear by Overexpression

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The inner ear houses organs used for hearing and balance that use hair cells to accomplish their tasks. Inner ear development remains to be fully understood, and advancing knowledge in development could lead to therapies and treatments for hearing problems. A gene called Atoh1 is necessary for hair cell formation and has been shown to increase hair cell number when overexpressed. Importantly, microRNAs from the 183 family (miRs-183, -182, and -96) are also expressed in developing hair cells. MicroRNAs are small RNA molecules that bind to messenger RNAs and prevent translation. MicroRNAs have been associated with cellular functions such as programmed cell death, cell division, and differentiation. In 2009, miR-96 was implicated in a congenital form of human deafness. Like Atoh1, miR-96 increases hair cell number when over-expressed. However, we do not know if the effects of overexpressing these genes will be additive. To address this, we plan to inject the inner ears of chicken embryos with a virus that causes overexpression of miRNAs from the 183 family and Atoh1. In order to establish the effects of injecting this virus, we are gathering data on control embryos injected with a non-bioactive virus to acquire a baseline for hair cell quantification. Hair cells will be quantified using image-analysis software after injection of the virus. The data collection methods are still being refined and we do not yet have any data. Further research potentially could utilize these results to develop therapeutic treatments for deafness.